X-ray Imaging of tumor microvasculature

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Abstract

We show that optimized Au nanoparticles enable high resolution three dimensional (3D) x-ray imaging to detect the angiogenic microvessels of brain glioma tumors and the related leakage. The study included in vivo and post-mortem whole organ phase contrast imaging plus nanoscale 3D X-ray microscopy. This strategy led to a detailed analysis of the relation between xenografted cancer cells and the tumor-induced angiogenic microvasculature in mouse brains. In addition, we could detect and study nanoparticle leakage, a phenomenon of interest for nanomedicine applications. Specifically, we were able to analyze tumors induced by stereotactic inoculated glioma cells, and to correlate their position and propagation to the microvasculature. Complementary tests were conducted on cells loaded with fluorescent Au nanoparticles. We thus found that, after endocytotic internalization, such nanoparticles allow visible-light detection of cells. Furthermore, they exhibit the same contrast-agent performances as non-fluorescent nanoparticles, becoming dual imaging agents.